decreasing abundance: (1) dominantly streaky, green and dark-gray, tuffaceous or arenaceous argillite; (2) dominantly medium- to coarse-(3) dominantly massive to foliated metatuff, tuff breccia, and pillow breccia intercalated with minor amounts of dark-gray, argillaceous metasedimentary rock. Different types of matrix are commonly intimately intermixed, but locally one type may dominate. Blocks within the matrix of the Khaz Formation closely resemble rocks in other units of the Kelp Bay Group. The Khaz is distinguished from the

> consider the Khaz to be an integral part of the accretionary complex represented by the Kelp Bay The Khaz Formation forms a belt which separates the rest of the Kelp Bay Group, which is a collage of fault-bounded blocks (the Freeburn assemblage). from the Sitka Graywacke, which is a broken formation (Decker and others, 1979) of disrupted graywacke turbidites. Poorly controlled fossil ages and petrologic similarities between the sandstones in the Sitka Graywacke and the Khaz (Decker, 1980b) suggest that these two units may be depositionally related to one another. However, the differing degrees of compositional and tectonic complexity between these two units indicates that they may have sustained different deformational histories since deposition. No fossils have been reported from the matrix of the Khaz Formation. Fossils found in blocks within the melange include a possibly Triassic or Jurassic scleractinian coral (Loney and others, 1975) and several species of Buchia: Buchia piochii(?) of Tithonian age (Loney and others.

formation of the melange. Lacking other age information, we therefore assign the Khaz a Cretaceous age. The Khaz Formation correlates with other

components of the melange facies of the upper Mesozoic accretionary terrane of Plafker and others (1977), including parts of the Uyak Complex on Kodiak Island (Connelly, 1978) and of the McHugh Complex of the Chugach Mountains (Karl and others, 1979) Freeburn assemblage (Cretaceous?)--Kilometer-scale, fault-bounded, lozenge-shaped blocks of metasedimentary and metavolcanic rocks which form a continuous belt on Chichagof and Yakobi Islands immediately west of the Border Ranges fault belong to the informal Freeburn assemblage. The western margin of the assemblage is its contact with the Khaz Formation. Parts of the Freeburn have previously been mapped as unnamed schist units (Reed and Coats, 1941; Rossman, 1959; Loney and others, 1975), and as Waterfall Greenstone (Loney and others, 1963, 1975), and Pinnacle Peak Phyllite (Loney and others, 1963, 1975). The Waterfall Greenstone and Pinnacle Peak Phyllite are previously designated formations within the Freeburn assemblage.

The Freeburn assemblage includes rocks that appear

to be compositionally, texturally, and structurally related. Although metamorphic grade tends to increase from west to east, similar sedimentary and volcanic protoliths can be recognized throughout the unit. Locally, lower textural grade blocks are structurally inserted between higher grade blocks. The structural grain of the complex is dominantly northwest-southeast; mappable lithologic and textural subunits conform in shape to this pattern. The overall configuration of the subunits is that of a collage (Decker, 1980b), which is an assemblage of related, fault-bounded, elongate blocks that have moved relative to one another such that sharp breaks in lithologic ratios, metamorphic grade, and fabric orientation occur at the block boundaries. Although the ratios of various lithologies are highly variable from block to block, the same lithologies occur in nearly all blocks. The dominant lithologies include tuffaceous argillite, tuff, massive greenstone, and graywacke turbidite. Other common lithologies include chert, limestone, phyllite, and schist. Various types of melange, such as those described as being within the Khaz Formation also occur locally within blocks in the collage. Metamorphic grade varies from block to block within the collage, but is generally consistent within an individual block. Lowest grade blocks include prehnite-pumpellyite facies argillite, metatuff, greenstone, and graywacke in which

sedimentary features are typically preserved. Higher grade blocks include foliated to phyllitic gray metasedimentary rocks and green metavolcanic rocks containing local, discontinuous segregation layers typically composed of quartz or quartz and sericite. Highest grade blocks include greenschist facies metasedimentary and metavolcanic rocks which are commonly foliated, crenulated, and contain millimeter-scale segregation layering. Mineral assemblages are a function of protolith and metamorphic grade. The highest grade metavolcanic rocks are characterized by epidote, clinozoisite, tremolite, actinolite, chlorite, albite, quartz, rare sodic amphibole (crossite?), biotite, or fuchsite. Highest grade metasedimentary rocks are characterized by quartz, albite, chlorite, muscovite, and graphite, commonly accompanied by pyrite or pale-pink garnet. Lowest grade metavolcanic rocks are characterized by calcic plagioclase, augite, chlorite, and magnetite, typically in various stages of replacement by epidote, chlorite, albite, calcite, and prehnite. Lowest grade

metasedimentary rocks are characterized by grains of plagioclase, quartz, volcanic rock fragments, and chert in a matrix composed of chlorite, clay minerals, calcite, epidote, prehnite, and white The age of the Freeburn assemblage can be bracketed with uncertainty by paleontologic and metamorphic-mineral isotopic-age determinations. The only fossils known from this unit are Lower Cretaceous Radiolaria from the Waterfall Greenstone (see below), which provide a maximum age for the formation of the Freeburn assemblage. Potassium-argon dating of actinolite and sericite concentrations from interlayered phyllitic metasedimentary and metavolcanic rocks near Pinta Bay yielded ages of 91-106 m.y. (Decker and others, 1980). If these minerals are syntectonic or post-tectonic (Decker, 1980b), the dates represent a minimum age for the Freeburn assemblage. If, however, the metamorphism represented by these minerals was pretectonic, the minimum age of the unit is unknown. In

recognition of this uncertainty, we assign the Freeburn assemblage a Cretaceous(?) age. The Freeburn assemblage, as a structurally disrupted component of the Kelp Bay Group, is correlated with other elements of the melange facies of the Chugach terrane. Freeburn assemblage--limestone Waterfall Greenstone -- Dominantly greenstone and lesser amounts of graywacke, greenschist, radiolarian chert and marble (Loney and others, 1963, 1975). Greenstone is chiefly light green to gray green, red weathering, massive to banded, locally foliated, and locally tuffaceous. Local relict textures indicate massive flows, flow breccia, pillow breccia, and tuff. Protoliths of the greenstone are subalkaline and tholeiitic basalts, on the basis of major-, minor-, and trace-element analyses reported by Decker (1980b). These analyses plot consistently in the ocean-floor

basalt fields of the basalt discrimination diagrams of Pearce and Cann (1973), Pearce and others (1975), and Garcia (1978) as shown by Decker (1980b). Greenstone typically contains intercalated lenses of white-weathering, red, green, and gray radiolarian chert; orangehornblende + biotite quartz diorite; contains 1-2

Late Jurassic to Early Cretaceous (Berg and Hinckley, 1963; Loney and others, 1963; Loney and others, 1975), as determined from fossils reported to have come from graywacke on Kruzof Island (Reed and Coats, 1941) and collected on Chichagof Island by Overbeck (1919) and by Loney and others (1975). The Kruzof Island(?) collection includes Terebellina palachei and Aucella crassicollis, ndicating an Early Cretaceous age (Reed and Coats, 1941, p. 50). Several species of Buchia ranging in age from Late Jurassic to Early Cretaceous, were collected from rocks in Slocum Arm on Chichagof Island by Overbeck (1919. p. 108), Loney and others (1975, p. 25), and Decker (1980b). In addition, Inoceramus prisms of Cretaceous or Jurassic age (Loney and others, 1975, p. 25) were found in argillite on Emmons Island. Material from the same locality was reported to be late Valanginian-early Hauterivian by Plafker and others (1976). Recent mapping has placed the fossiliferous rocks in Slocum Arm within the Kelp Bay Group (Decker, 1980a; this report) and the fossiliferous rocks on Emmons Island within an informal Mesozoic and Paleozoic(?) undivided unit of highly tectonized rocks (this report). Therefore, the only fossils presently believed to be from the Sitka Graywacke are those of Early Cretaceous age reported to have come from Kruzof Island. The only other age control on the Sitka Graywacke is the intrusion of Eocene granodiorite (Loney and others, 1975) on Baranof Island. We therefore assign a Cretaceous age to the Sitka Graywacke

thermally metamorphosed to at least hornblendehornfels facies. Metamorphic minerals include biotite, garnet, and andalusite. On western Yakobi Island, banded quartzofeldspathic gneiss and migmatite occur at the contacts with Tertiary(?) tonalite and gabbronorite plutons SITKA GRAYWACKE VOLCANICS--dominantly basaltic KELP BAY GROUP--Complicated, heterogeneous assemblage of various fault-bounded metavolcanic and metasedimentary rocks exposed on northern Baranof Island, and western Chichagof and Yakobi Islands. On Chichagof and Yakobi Islands, the Kelp Bay Group includes the Khaz Formation and the Freeburn assemblage Khaz Formation (Cretaceous) -- Chaotically deformed rocks composed of blocks of greenstone, greenschist, tuff, graywacke, argillite, chert, limestone, and phyllite in a foliated argillaceous and tuffaceous matrix. The Khaz Formation is a melange characterized by a blocks-and-matrix fabric and lack of consistent internal stratigraphy. The deformational styles of the blocks and of the matrix are the result of a continuum of soft, prelithification deformation to brittle, post-lithification deformation. Relationships are now sufficiently obscured by overprinting and differing competencies of the lithologies involved that initial deformational phases are impossible to isolate except on a small, local scale. Components of the melange include blocks of differing composition, texture and metamorphic grade, and several types of matrix which were first recognized by Decker (1980a, 1980b). Matrix types include, in order of

HORNBLENDE-HORNFELS FACIES, METAMORPHIC EQUIVALENT OF

SITKA GRAYWACKE (CRETACEOUS) -- In the vicinity of

Tertiary(?) plutons, the Sitka Graywacke has been

rest of the Kelp Bay Group by the presence of a matrix and the distinctly chaotic style of deformation. On the basis of lithologic affinities and structural relationships, we

1975), Buchia c.f. B. fischeriana of Tithonian age (Decker, 1980b), Buchia subokensis of Berriasian age (Loney and others, 1975), and Buchia okensis of Berriasian age (Decker, 1980b). The Buchia localities are along the southwest shore of Slocum Arm. The youngest fossils found in blocks within the melange provide a maximum Berriasian age of

> the Kelp Bay Group, we assign it a Cretaceous(?) GRANODIORITE (CRETACEOUS OR JURASSIC)--Light- to medium-gray (C. I. 10-20), medium-grained, hornblende + biotite granodiorite which contains zones of biotite granite. Hornblende and biotite are generally approximately equal. Generally hypidiomorphic, equigranular, and weakly foliated and has local zones of fracturing and shearing. Commonly contains scattered rounded, fine-grained, mafic inclusions. Unit is very poorly exposed; crops out south of Patterson Bay TONALITE (CRETACEOUS OR JURASSIC) -- White- to mediumgray (C. I. 2-35), medium- to coarse-grained,

biotite + hornblende tonalite and biotite ± muscovite ± garnet tonalite which contain a wide range of quartz to plagioclase ratios (approx. 1:4 to 1:1). Plagioclase-rich samples tend to contain hornblende and have a higher color index; quartzrich samples tend to be hornblende-free and leucocratic. Rock is principally allotriomorphic, equigranular, and generally weakly foliated away from major faults. In the vicinity of Peril Strait fault, it is generally seriate and commonly has shear foliation and locally extensive cataclasis. The tonalite contains local zones of fine-grained, rounded, mafic inclusions, and occasional, pink pegmatitic dikes. Unit crops out along the Peril Strait fault and south of Patterson Bay QUARTZ DIORITE AND TONALITE (CRETACEOUS OR JURASSIC)--

weathering, green, volcaniclastic graywacke; minor

argillite. Chert occurs as tightly folded blocks

graphitic partings, and as streaky lenses and pods

Waterfall Greenstone is generally recrystallized

prehnite with occasional relict plagioclase and

augite phenocrysts. Clasts in fine- to medium-

grained graywacke include plagioclase, quartz,

epidote, prehnite, and clay minerals. Because the

components of the Freeburn assemblage, we consider

gray to tan limestone; and dark-gray tuffaceous

of ribbon chert that contain chloritic or

argillite generally occur as lenses.

within the greenstone. Graywacke is locally

interlayered with greenstone. Limestone and

to epidote, chlorite, albite, calcite, and

volcanic rock fragments, and chert in a

recrystallized matrix composed of chlorite,

Waterfall Greenstone is fault-bounded and

it to be an integral part of the assemblage.

on the ridge immediately east and north of

lithologically and texturally similar to other

The name Waterfall Greenstone was proposed by

Waterfall Lake, the type locality. Loney and

association with the Whitestripe Marble, which

they considered to be Triassic(?). Radiolarian

collections from lenses of chert in greenstone

Cretaceous age (Charles Blome, oral commun., 1980;

(Parona), of middle Tithonian to late Valanginian

age (Pessagno, 1977); Thanarla sp. c.f. T. conica

(Aliev), of Early Cretaceous age (Pessagno, 1977)

and Archiodictyomitra apiarium (Rust), of

assigned an Early Cretaceous age.

and others (1977)

the assemblage.

the schist.

Berriasian to late Valanginian age (Pessagno,

1977). The Waterfall Greenstone is, therefore,

chert collected from greenstone in the McHugh

Complex (Karl and others, 1979), which is also

Chert in the Waterfall Greenstone is coeval with

considered to be a component of the melange facies

of the Cretaceous accretionary terrane of Plafker

Pinnacle Peak Phyllite--Dominantly chloritic and

turbidite. Similar rocks occur throughout the

Freeburn assemblage as individual collage units

in an argillaceous matrix. The Pinnacle Peak

consistently higher metamorphic grade than the

rest of the Kelp Bay Group, forming a long, narrow

bounded and lithologically and texturally similar

to other components of the Freeburn assemblage; we

therefore consider it to be an integral part of

Graphitic and chloritic schist in the Pinnacle

Occasionally, original sedimentary textures, as

typically alternate on about a meter scale.

relatively competent blocks of metasandstone,

Siliceous graphitic schist is more common than

chloritic schist, and is characterized by quartz,

sericite, and albite in layers as much as 0.5 in.

thick, but averaging less than 0.1 in. thick, with

graphite. Garnet, pyrite, and calcite are common

accessory minerals. Green chloritic schist is

Calcite and, rarely, muscovite may be present.

Phyllite is generally dark gray, siliceous, and

foliated and has a well developed phyllitic sheen

on foliation surfaces. Metamorphic minerals are

siliceous segregation layering occurs locally.

Phyllite is composed principally of quartz and

segregation layers occur, they consist of quartz

muscovite, epidote, and pyrite occur locally in

quartz, sedimentary and volcanic rock fragments.

segregation layers as much as 0.2 in. thick have

metasandstone layers. Locally, these segregation

within the turbidite beds. Schists and phyllites

The name Pinnacle Peak Phyllite was proposed by

siliceous phyllite unit which is well exposed on

Pinnacle Peak. Loney and others (1975) correlate

the Pinnacle Peak Phyllite with the basal part of

the "schist" unit of Reed and Coats (1941) and

No fossils have been reported from the Pinnacle

Peak Phyllite. Loney and others (1963, 1975)

assigned a Triassic(?) age to the unit because

Triassic(?) Whitestripe Marble. However, the

lithologically, texturally, and structurally

Because there is no evidence that the Pinnacle

Border Ranges fault is now known to separate these

Peak Phyllite is of different age than the rest of

they believed it conformably overlay the

two units. The Pinnacle Peak Phyllite is

similar to the rest of the Kelp Bay Group.

Rossman (1959).

Loney and others (1963) for a thinly laminated,

developed parallel to sedimentary layering in

layers follow sedimentary convolute layering

are commonly highly crenulated and lineated.

the phyllite. Metagraywacke turbidites consist of

feldspar that have graphitic coatings; where

and albite. Grains of chlorite, actinolite,

albite, epidote, chlorite, tremolite, garnet.

calcite, biotite, and magnetite, with local

veining and replacement by prehnite. Ouartz

characterized by epidote, clinozoisite, chlorite,

through the metamorphic fabric. Locally.

partings rich in muscovite, chlorite, and

actinolite, tremolite, albite, and quartz.

extremely fine grained, and discontinuous

Peak Phyllite are often intimately associated and

well as relict melange textures, can be recognized

metachert, and greenstone can be identified within

and also in the Khaz Formation as discrete blocks

phyllite, and nonfoliated metagraywacke

Phyllite consists of numerous blocks of

band immediately west of the Border Ranges

fault. The Pinnacle Peak Phyllite is fault-

graphitic schist, as well as graywacke semischist.

locality d on map) including Parvicingula boesi

have yielded diagnostic Radiolaria of Early

the Waterfall Greenstone on the basis of its

Loney and others (1963) for rocks which crop out

others (1963, 1975) assigned a Triassic(?) age to

Dominantly medium- to dark-gray (C. I. 20-55), medium-grained, foliated, hornblende + biotite quartz diorite and biotite + hornblende tonalite. Commonly contains as much as 2 percent magnetite. Hornblende tends to be most abundant in quartz diorite; biotite is most abundant in tonalite. Rock is variably hypidiomorr allotriomorphic, equigranular to seriate, and weakly to strongly foliated. Gneissic banding and nebulitic to agmatitic migmatites are common. The gneissic features, elongate mafic inclusions, and color index all increase near the amphibolite, gneiss, schist, and marble map unit (MzPza). Quartz veins and pods and aplite dikes are found locally. Unit crops out in several bands from Lisianski Strait to Patterson Bay. Large areas having abundant inclusions and septa of metamorphic rocks are shown by a stipple pattern

QUARTZ DIORITE (CRETACEOUS OR JURASSIC) -- Medium- to dark-gray-green (C. I. 25-50), medium- to coarsegrained, foliated hornblende ± biotite quartz diorite in which hornblende is always more abundant than biotite. One to 2 percent magnetite is common in these rocks; some samples contain as much as 5 percent. Pyroxene-cored hornblende crystals are common locally. Rock is principally hypidiomorphic, equigranular, and poorly to well foliated; however, in the vicinity of major faults it becomes allotrimorphic, seriate, and cataclastic. Unit crops out along the west side of Lisianski Inlet and Hoonah Sound. On Yakobi Island, this unit is typically extensively sheared, altered, and light to dark green. Angular to rounded, elongate, fine-grained, mafic inclusions are common, and minor nebulitic to banded gneiss zones are found locally, as are scattered quartz veins and pods, aplite veins, and leucocratic granitic veins

BIOTITE-BEARING DIORITE (CRETACEOUS OF JURASSIC) -- Poorly exposed, medium-gray (C. I. approx. 40), medium-grained, hornblende + biotite diorite. Hornblende is more abundant than biotite, although biotite is present in all samples. Rocks are generally hypidiomorphic. equigranular to seriate, and very weakly foliated. Unit locally contains numerous, small, rounded mafic inclusions. Crops out northwest of Patterson Bay

DIORITE (CRETACEOUS OR JURASSIC) -- Dominantly mediumto dark-gray-green (C. I. 35-50), medium- to coarse-grained, foliated hornblende diorite and minor clinopyroxene gabbro; contains as much as 3 percent magnetite. Principally allotriomorphic and seriate, although locally hypidiomorphic and equigranular. Diorite is typically extensively altered so that only relicts of the primary minerals are identifiable. Unit is pervasively sheared, locally to cataclasite, and generally well foliated. Local zones of banded to nebulitic gneiss and rounded, elongate, mafic inclusions are common. Aplite dikes and leucocratic granitic veins occur locally. Unit crops out in various bodies in the northeastern part of the study area GABBRO (CRETACEOUS OR JURASSIC) -- Medium - to dark-gray (C. I. 30-40), medium- to coarse-grained, gneissic pyroxene + hornblende gabbro and leucogabbro and local foliated hornblende ± biotite diorite; gabbro commonly contains 2-4 percent magnetite. Rocks are principally hypidiomorphic, equigranular, and have weak- to well-developed foliation. Banded to migmatitic gneiss is common. Gabbro crops out east of the Peril Strait QUARTZ GABBRO AND GABBRO (CRETACEOUS OR JURASSIC)--

Medium- to dark-gray (C. I. 25-35), mediumgrained, pyroxene + hornblende ± biotite quartz gabbro and gabbro. These rocks contain as much as 2 percent magnetite and are principally hypidiomorphic, equigranular, and weakly foliated. Locally banded, granitic veins are common. Unit crops out west of Ushk Bay TONALITE (JURASSIC) -- Light - to medium-gray (C. I. approx. 20), coarse-grained, locally porphyritic, foliated biotite + hornblende tonalite which is generally hypidiomorphic, seriate, and well foliated. Biotite is commonly more abundant than

hornblende. Unit contains elongate, fine-grained, mafic inclusions and local quartz veins, particularly near the border zones. A sample of the tonalite (locality 1 on map) has been dated at 152±4 m.y. on biotite and 151±5 m.y. on hornblende by the potassium-argon method (Loney, Brew, and Lanphere, 1967). Unit crops out at the southern end of the study area on Peril Strait QUARTZ DIORITE (JURASSIC) -- Poorly exposed, medium-gray (C. I. 30-35), medium- to coarse-grained,

MISCELLANEOUS FIELD STUDIES percent magnetite; hornblende is always more abundant than biotite. Principally hypidiomorphic, equigranular to seriate, and weakly foliated. Elongate to nebulitic mafic inclusions are common near contacts. A hornblende STRIKE AND DIP OF BEDS separate of a sample of quartz diorite (locality 2 on map) has been dated at 164±5 m.y. by the from sedimentary features potassium-argon method (Loney, Brew, and Lanphere Overturned-Bar and ball indicates tops of beds 1967). Unit crops out south of Ushk Bay WHITESTRIPE MARBLE (TRIASSIC?) -- Marble composed of nearly pure calcite, but locally contains

accessory chlorite, sericite, graphite, quartz,

inhomogeneous and irregular neomorphic

albite, and pyrite. The calcite is a product of

recrystallization similar to the crystallization

(1941) reported local occurrences of cream-colored

dolomite. The unit varies from less than 100 ft

The name Whitestripe Marble was proposed by Loney

unfossiliferous, massive- to thick-bedded, white-

to light-gray, fine-grained marble, which is well

locality. Loney and others (1963, 1975) assigned

a Triassic(?) age to the Whitestripe Marble on the

age found in a boulder in the Goon Dip River (Reed

been found in place within the marble. The marble

basis of a coralline fossil of possible Triassic

and Coats, 1941). No recognizable fossils have

appears to lie conformably above the Goon Dip

Greenstone, although locally the contact is a

steep fault. The marble is intruded by numerous

mafic dikes and sills; the largest are shown on

the map as Cretaceous(?) diorite. One diorite

Whitestripe Marble for many miles. The western

Border Ranges fault (Plafker and others, 1976;

Decker and Johnson, 1981). Plafker and others

in the Wrangell Mountains. The marble is

GOON DIP GREENSTONE (TRIASSIC?) -- Dark grayish green,

a subaerial origin for at least some of the

flows. Relict labradorite laths and augite

although most of the greenstone has been

locally porphyritic or holocrystalline

(1976) and Jones and others (1977) correlate the

Whitestripe Marble with the Chitistone Limestone

considered to be a part of Wrangellia along with

dense, fine grained, commonly amygdaloidal, and

sills, and flow breccias 3-15 ft thick. Locally,

red oxidized flow tops and pipe amygdules suggest

crystals support an original basaltic composition,

recrystallized to epidote, actinolite, chlorite,

albite, prehnite, calcite, pyrite, and sphene.

Foliated greenstone is composed dominantly of

chlorite or prehnite. The greenstone also

bearing sulfides.

commonly contains sparsely distributed copper-

and others (1963) for a sequence of dominantly

massive greenstone with minor greenschist and

and Coats (1941) and the "greenstone" unit of

Rossman (1959). No fossils have been reported

from the Goon Dip Greenstone. Loney and others

the basis of its conformity with the overlying

Nikolai Greenstone of the Wrangell Mountains in

southern Alaska on the basis of similar lithology

overlying Whitestripe Marble which they correlated

with the Upper Triassic Chitistone Limestone also

AND PALEOZOIC?) UNDIVIDED--A complex assortment of

recognize, and rocks of different compositions and

Triassic(?) Whitestripe Marble. Plafker and

correlated the Goon Dip Greenstone with the

and stratigraphic position relative to the

IGNEOUS, METAMORPHIC, AND SEDIMENTARY ROCKS (MESOZOIC

highly tectonized igneous, metamorphic, and

study area. Protoliths are difficult to

undisturbed to brecciated or mylonitic.

order of abundance) interlayered mafic

and Peril Strait.

metavolcanic and siliceous to calcareous

sedimentary rocks are located along the Peril

Strait fault zone at the eastern margin of the

textures are juxtaposed along faults and shear

zones. Textures range from massive to foliated.

Recognizable lithologies include (in decreasing

metasedimentary rock, granodiorite, amphibolite,

metagraywacke turbidite, Inoceramus-bearing

calcareous argillite, and serpentinized gabbro.

These rocks may or may not have originally been

related to one another. They commonly occur on

the islands in Hoonah Sound, or as blocks tens of

Inoceramus prisms and belemnites have been found

a late Valanginian-early Hauterivian age (Plafker

rock is overlain by greenstone pillow breccia,

diorite. These rocks are of uncertain affinity,

Graywacke by Loney and others (1963, 1975). The

rocks on Emmons Island are far removed from any

No age determinations have been made for other

lithologies and structural complexity suggest to

us that some of the faulted blocks may be similar

PALEOZOIC) -- High-grade metamorphic rocks composed

locally intercalated with thin units of marble and

to Paleozoic rocks on eastern Chichagof Island.

We therefore assign this unit a Mesozoic and

chiefly of amphibolite, gneiss, and schist,

calc-silicate granofels, are faulted against

metasedimentary and metavolcanic rocks to the

west, and grade into dioritic rocks to the east.

The amphibolite unit was first mapped by Rossman

(1959), and extended to include Rossman's marble

sequence by Loney and others (1975). The most

common lithology in this unit is a quartz-

andesine-biotite-hornblende schist, typically

containing almandine garnet; with alternating

plagioclase-hornblende and quartzofeldspathic

layers several inches thick. Common accessory

sphene. Relatively pure, white marble and calc-

minerals include apatite, epidote, pyrite, and

silicate granofels occur locally as thin units

several feet thick, particularly along Peril

Strait between Poison Cove and Deep Bay. The

calc-silicates are characterized by calcite,

plagioclase, diopside, clinozoisite, quartz,

grossularite, pyrite, and sphene. Loney and

this unit to be transitional between the

at least locally intrude the gneiss, are

volcanic rock and marine sediments.

or Jurassic on the basis of similar

others (1975) considered the metamorphic facies of

hornblende hornfels, and amphibolite facies. It

becomes increasingly migmatitic near its contact

with large diorite bodies along the eastern edge

of the map area. The protolith of this unit, on

the basis of bulk composition, was probably mafic

No direct age determinations have been made for

considered by Loney and others (1975) to be of

correlations with radiometrically dated plutonic

rocks to the north and south of the mapped area.

We consider these plutonic rocks to be Cretaceous

correlations. Lacking any other age information,

aphanitic, dominantly siliceous rocks including

light-green, tuffaceous quartzose sandstone; white

to buff, rusty-weathering, thinly laminated felsic

metatuff; light-gray, thin-bedded, fine-grained,

unfossiliferous limestone; and dark-gray, slatey

argillite; all of which are intercalated with

precludes precise estimations of thickness, but

Greenstone to the west, this unit is generally

by tonalite of Cretaceous or Jurassic age and

the unit as a whole is probably more than 200 ft

microdiorite bodies. To the east it is intruded

metavolcanic rock of slightly higher metamorphic

grade than the overlying Goon Dip Greenstone was

sandstone, and greenstone unit by Loney and others

unconformably underlie the Goon Dip Greenstone and

recognized by Reed and Coats (1941), by Rossman

No ages have been determined for the rocks in this

favored a pre-Mesozoic age. Loney and others

with Loney and others (1975). Because the Goon

Dip Greenstone has been correlated with the

overlies the Permian Skolai Group of southern

to the Skolai rocks. However, there is very

Alaska, the rocks of this unit may be equivalent

little lithologic correspondence between these two

units. The Skolai Group consists of a basal unit

limestone (Smith and MacKevett, 1970). Thus, this

of mafic flows and tuffs, a middle unit of dark-

carbonaceous bioclastic limestone, and a thick,

unit is lithologically distinct from the Skolai

HORNFELS, SCHIST, AND GNEISS (PALEOZOIC?) -- Dominantly

fine-grained hornfels; also includes foliated,

to black amphibolite. Locally contains white,

quartzite. Metamorphic grade varies with

derived from the middle Paleozoic rocks of

MARBLE (PALEOZOIC?) -- Generally massive, dark-gray to

from less than 0.5 in. to several feet in

thickness. Chert nodules and contorted ribbon

chert are abundant at some localities. These

have been derived from the calcareous middle

Island. Unit occurs east of the Peril Strait

Paleozoic rocks of northeastern Chichagof

weathering. Occurs in blocks and layers; range

rocks are considered by Loney and others (1975) to

white, fine- to medium-grained, and gray

granoblastic, layered, light-gray to light-green,

layered, medium- to dark-gray, medium- to coarse-

banded metachert layers and white, garnet-bearing

proximity to intrusive bodies. These rocks are

considered by Loney and others (1975) to have been

northeastern Chichagof Island. Unit is found east

grained schist and gneiss, and foliated, dark-gray

colored cherts, black shale, sandstone, and

upper unit of massive, bioclastic, Permian

Group, but apparently occupies a similar

stratigraphic position

of the Peril Strait fault

(1975) assigned it an early Mesozoic or Paleozoic

relationship. Lacking further evidence, we concur

Nikolai Greenstone (Jones and others, 1977), which

metavolcanic rocks compose approximately 40

percent of the sequence. Complex faulting

thick. Near its contact with the Goon Dip

intruded by abundant mafic dikes and small

faulted against amphibolite and gneiss. A

(1959), and was named the chert, limestone,

unit. Rossman (1959) considered it to

age on the basis of the same stratigraphic

(1975, p. 15).

heterogeneous unit of metasedimentary and

well-foliated greenstone and greenschist. Mafic

grayish-green, white-weathering ribbon chert;

we concur with the Mesozoic or Paleozoic age

assignment for this unit by Loney and others

SILICEOUS METASEDIMENTARY AND METAVOLCANIC ROCKS

this unit. The associated dioritic bodies, which

probable Cretaceous age on the basis of lithologic

AMPHIBOLITE, GNEISS, SCHIST, AND MARBLE (MESOZOIC OR

pieces of this unit, but the wide variety of

which lies against migmatite and sheared

but were considered to be part of the Sitka

other rocks in the Sitka Graywacke and are

distinctly different lithologically.

and others, 1976, p. 15; locality a on map). This

feet in dimension along the shores of Hoonah Sound

n calcareous argillite on Emmons Island, yielding

greenstone, amphibole gneiss, greenschist, marble,

of the Wrangell Mountains. The Goon Dip

Greenstone is considered to be a part of

Wrangellia by Jones and others (1977)

others (1976) and Jones and others (1977)

(1975) considered this unit to be Triassic(?) on

marble. This unit is equivalent to the

epidote, chlorite, and albite. Relict amygdules

are filled with quartz and epidote, accompanied by

The name Goon Dip Greenstone was proposed by Loney

"greenstone schist" and "greenstone" units of Reed

greenstone. The greenstone consists of flows,

the Goon Dip Greenstone by Jones and others (1977)

contact is interpreted to be the location of the

body follows the western contact of the

characteristics of the Chitistone Limestone as

described by Armstrong and MacKevett (1977).

Marble is locally stylolitic; Reed and Coats

to a maximum of about 1,500 ft in thickness:

and others (1963) for a long, narrow belt of

exposed on Whitestripe Mountain, the type

average thickness is 300 ft

known from sedimentary features STRIKE AND DIP OF FOLIATION Inclined Vertical BOUNDARY OF WESTERN CHICHAGOF AND YAKOBI ISLANDS WILDERNESS STUDY AREA BORDER RANGES FAULT

PSF PERIL STRAIT FAULT

SAF SLOCUM ARM FAULT POTASSIUM-ARGON AGE DATE LOCALITY--See text for dates FOSSIL LOCALITY Inoceramus prisms and belemnites; late Valanginian-

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts require the U.S. Geological Survey and the U.S. Bureau of Mines to survey certain areas on Federal lands to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a geological survey of the Western Chichagof-Yakobi Islands Wilderness Study Area in the Tongass National Forest, Alaska. About 65 percent of the study area was established as a wilderness on December 2, 1980, under the Alaska National Interest Lands Conservation Act (P.L. 96-487).

INTRODUCTION

in the Alexander Archipelago of southeastern Alaska. The study area is bounded on the northeast by a linear topographic low which includes Hoonah Sound and Lisianski Inlet, and which nearly separates eastern Chichagof Island from western Chichagof Island. The study area is bounded on the southeast by Peril Strait, on the northwest by Cross Sound, and on the southwest by the Pacific Ocean. The study area is approximately 60 mi long by 20 mi wide at the widest

GEOLOGY The sedimentary and metamorphic rocks of western Chichagof and Yakobi Islands can be divided into four roughly linear belts that have their long dimensions alined northwest-southeast; each belt is younger in a progression from northeast to southwest. The oldest rocks in the study area form a discontinuous belt along Hoonah Sound and Lisianski Inlet consisting of Mesozoic and Paleozoic(?) medium- to high-grade metasedimentary rocks, metavolcanic rocks, and sheared intrusive rocks. The next belt of rocks to the southwest is composed of Triassic(?) greenstone and massive marble which have been correlated with rocks of the Wrangellia terrane to the north (Jones and others, 1977). Both of these northeastern belts are extensively disrupted by Jurassic and Cretaceous foliated diorite, quartz diorite, and tonalite. The two northeastern belts are separated from two belts of younger rocks to the southwest by a major fault which has been correlated with the Border Ranges fault of the Chugach Mountains (Plafker and others, 1976, 1977; Decker and Johnson, 1981). The fault is believed to represent a mid-Cretaceous to early Tertiary accretionary event (MacKevett and Plafker, 1974; Plafker and others, 1976; Decker and Johnson, 1981) which juxtaposed Cretaceous rocks to the west against the Triassic(?) and older terrane to the east. The Kelp Bay Group comprises the third belt in the study area. It consists of a tectonic assemblage of a variety of upper Mesozoic metasedimentary and metavolcanic rocks including greenschist, phyllite, greenstone, metatuff, graywacke, argillite, marble, and chert. These units typically occur as highly deformed, generally irregular, fault-bounded blocks. Southwest of the Kelp Bay Group, the fourth belt consists of Cretaceous sandstone, siltstone, and mudstone turbidites and massive graywacke and conglomerate, which constitute the Sitka Graywacke. Subsequent to the amalgamation of these four belts of rocks, the entire study area has been intruded by

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tonalite, granodiorite, and granite.

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CONTACT--Dashed where approximately located or inferred; dotted where concealed FAULT--Dashed where approximately located or inferred; dotted where concealed Inclined--Bar and ball indicates tops of beds known

early Hauterivian Buchia sp.; Berriasian hia sp.: Tithonian Radiolaria; Early Cretaceous

STUDIES RELATED TO WILDERNESS

Western Chichagof and Yakobi Islands are located